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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/582,673

06/22/2006

Toshiyuki Inagaki

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06/23/2009

OLIFF & BERRIDGE, PLC

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EXAMINER

KWON, ASHLEY M

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

06/23/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/582,673	<b>Applicant(s)</b> INAGAKI, TOSHIYUKI	
	<b>Examiner</b> ASHLEY KWON	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 27-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 27-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 6/12/06 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## **DETAILED ACTION**

### ***Response to Amendment***

In response to the amendment received June 9, 2009:

- a. Claims 27-39 are pending;
- b. In light of the arguments all previous rejections have been withdrawn and new rejections made.

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the electrolyte membrane having an extended portion which extends beyond the end of the catalyst layer and the end of the diffusion layer as claimed in claim 28 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering

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of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

Claim 34 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 34 makes the hard spacer optional, but it depends on claim 32 which requires a rigid spacer. Therefore it fails to further limit claim 32. Furthermore, applicant is asked to change "hard spacer" to "rigid spacer" in claim 34 in order to parallel the terminology in claim 32.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 37 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 37 recites the limitation "'bead gasket" in line 3 of the claim. There is insufficient antecedent basis for this limitation in the claim. For the purposes of this rejection, claim 37 will be interpreted as depending on claim 36 instead of claim 37. Please make appropriate changes.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

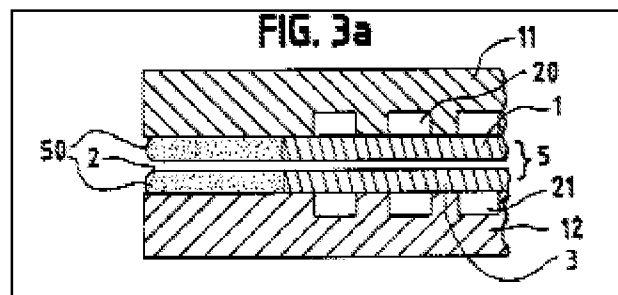
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 27-30 and 34-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid et al (US Pat. No. 6,080,503) (hereinafter "Schmid") in view of Kye (US Pat Pub. 2004/0197563).

Regarding claim 27, Schmid discloses a fuel cell stack (see fig. 1) comprising: a pair of separators (11, 12); an MEA (5) in which an electrolyte membrane (2), a catalyst layer, and a diffusion layer (electrode layers 1, and 3) are laminated (see col. 1, lines 21-33), and which is provided between the pair of the separators; and an adhesive layer (50) provided between the pair of the separators, which contacts at least an end of the electrolyte membrane, an end of the catalyst layer and an end of the diffusion layer (see fig. 3a). Schmid discloses two possible MEA configurations, one where the membrane extends beyond the electrodes, and another where the membrane is coextensive with the electrodes (see col. 6 line 61 – col. 7, line 5). In both configurations the adhesive layer would contact at least an end of the membrane, catalyst layer, and diffusion layer.



Schmid fails to disclose a fuel cell stack wherein the adhesive layer has a Young's modulus of at most within the range of 30 MPa to 100 MPa. Schmid does disclose that epoxy resins are suitable for use in his invention (see col. 5, lines 37-40).

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Kye teaches that epoxy adhesives have been used in various industries to bond one surface of a substrate to an adjacent surface of another substrate (see paragraph 2). He teaches adhesive compositions that have enhanced flexibility and elongation characteristics and a Young's modulus over a wide range (see paragraphs 10,156, and 157). Because Kye teaches so many different embodiments of his invention with differing Young's modulus values, it shows that these values are result effective variables. Kye teaches an embodiment where the adhesive compositions have a Young's modulus in the range of about 3.9 ksi to about 40 ksi (or about 20 MPa to about 260 MPa) (see paragraph 157). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). Since it is clear from the teaching of Kye that epoxy resins can be modified in order to have a wide range of Young's modulus values, it would have been obvious to a person of ordinary skill in the art to find an optimal range for the adhesive taught by Schmid.

Regarding claim 28, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein; the electrolyte membrane has an extended portion which extends beyond the end of the catalyst layer and the end of diffusion layer (*Schmid*: see col. 6, lines 61-67), and a portion of the adhesive layer is provided between the extended portion of the electrolyte membrane and one of the pair of separators so as to contact a surface of the extended portion, and another portion of the adhesive layer is provided between the extended portion of the electrolyte membrane and another of the pair of

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separators so as to contact another surface of the extended portion (*Schmid*: see fig. 3a). Schmid discloses that the catalyst layer is provided at the interface between electrode layer and the PEM layer (see col. 1, lines 26-30). Therefore, if the PEM is extended beyond the electrode layer, then it also would be extended beyond the catalyst layer as well.

Regarding claim 29, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein; a portion of the adhesive layer is provided between one of the pair of the separators and the catalyst layer so as to contact a surface of the catalyst layer; and another portion of the adhesive layer is provided between another of the pair of the separators and the diffusion layer so as to contact a surface of the diffusion layer. Schmid clearly shows in fig. 3a that the adhesive layer (50) contacts a surface of the diffusion layer. Although the catalyst layer is not shown in fig. 3a, Schmid discloses that the catalyst layer is located at the interface between the electrode (diffusion layer) and PEM layer (see col. 1, lines 25-30). Therefore the adhesive layer would necessarily contact a surface of the catalyst layer as well.

Regarding claim 30, Schmid in view of Kye fails to explicitly disclose the fuel cell stack according to claims 27, wherein: the Young's modulus of the adhesive layer is within a range of 50 MPa to 30MPa. However, as explained above for claim 27, because Kye teaches so many different embodiments of his invention with differing Young's modulus values, it shows that these values are result effective variables. Kye teaches an embodiment where the adhesive compositions have a Young's modulus in the range of about 3.9 kis to about 40 ksi (or about 20 MPa to about 260 MPa) (see



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paragraph 157). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). It is clear from the teaching of Kye that epoxy resins can be modified in order to have a wide range of Young's modulus values, it would have been obvious to a person of ordinary skill in the art to find an optimal range for the adhesive taught by Schmid.

Regarding claim 34, Schmid in view of Kye fails to explicitly disclose the fuel cell stack according to claim 32, wherein the adhesive layer has a thickness that allows the adhesive layer to have a Young's modulus of at most 100 MPa even if the hard spacer is provided in the adhesive layer.

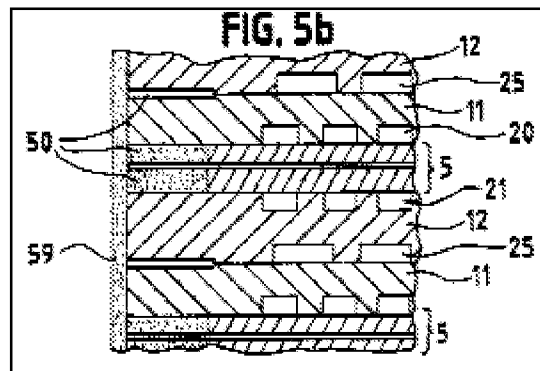
However, as explained above for claim 27, it is clear from the teaching of Kye that epoxy resins can be modified in order to have a wide range of Young's modulus values. Therefore it would have been obvious to a person of ordinary skill in the art to alter the adhesive layer so that it had a Young's modulus of at most 100 MPa even if the hard spacer is provided in the adhesive layer.

Regarding claim 35, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein multiple cells, each of which is formed by interposing the MEA between the pair of separators, are linearly arranged in a cell stacking direction, and the fuel cell stack further comprises an adhesive layer sandwiched between two cells adjacent to each other (*Schmid*: see col. 4, lines 32-34, see fig. 5b).

Regarding claim 36, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein multiple cells, each of which is formed by interposing the MEA between the pair of separators, are linearly arranged in a cell stacking direction, and a bead gasket is provided as a seal between two of the multiple cells, which are adjacent to each other, and a separator of the two of the multiple cells which contacts the bead gasket has a greater planar rigidity than a separator of another cells which does not contact the bead gasket. Schmid discloses that some of all the cells in the stack may be adhesively bonded together, and stack components such as end plates may also be adhesively bonded to adjacent components if so desired (see col. 4, lines 31-41). The adhesive layer disclosed by Schmid acts as a bead gasket. The term “bead gasket” does not limit the adhesive to any shape, and this claim is met as long as it provides a seal between multiple cells. It is obvious that cells which contact the bead gasket would have greater planar rigidity than a separator of another cell which does not contact the bead gasket because the bead gasket provides an extra adhesive bond.

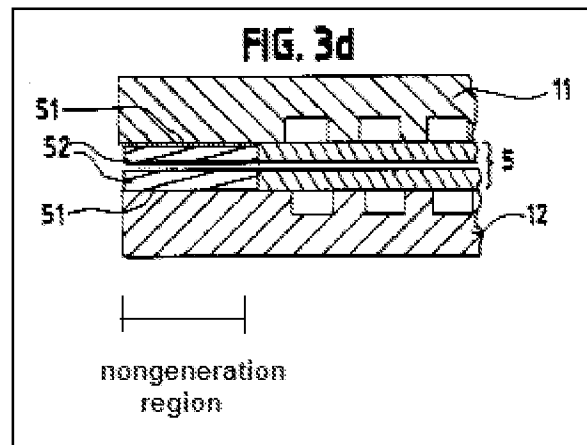
Regarding claim 37, Schmid in view of Kye discloses the fuel cell stack structure according to claim 36, further comprising a generally flat plate which is placed on the separator which contacts the bead gasket to increase the planar rigidity of the separator. Schmid discloses that a flat plate (end plate) may be adhesively bonded to adjacent components, which would be the separator (see col. 4, lines 38-41).

Regarding claim 38, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein the adhesive layer is provided between the separators in an entire non-power generation region (*Schmid*: see fig. 3a, see col. 4, lines 2-6).



Claims 27 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid in view of Kye.

Regarding claim 27, Schmid discloses a fuel cell stack (see fig. 1) comprising: a pair of separators (11, 12); an MEA (5) in which an electrolyte membrane (2), a catalyst layer, and a diffusion layer (electrode layers 1, and 3) are laminated (see col. 1, lines 21-33), and which is provided between the pair of the separators; and an adhesive layer (52) provided between the pair of the separators, which contacts at least an end of the electrolyte membrane, an end of the catalyst layer and an end of the diffusion layer (see fig. 3d). Schmid discloses two possible MEA configurations, one where the membrane extends beyond the electrodes, and another where the membrane is coextensive with the electrodes (see col. 6 line 61 – col. 7, line 5). In both configurations the adhesive layer would contact at least an end of the membrane, catalyst layer, and diffusion layer.



Schmid fails to disclose a fuel cell stack wherein the adhesive layer has a Young's modulus of at most within the range of 30 MPa to 100 MPa. Schmid does disclose that epoxy resins are suitable for use in his invention (see col. 5, lines 37-40).

Kye teaches that epoxy adhesives have been used in various industries to bond one surface of a substrate to an adjacent surface of another substrate (see paragraph 2). He teaches adhesive compositions that have enhanced flexibility and elongation characteristics and a Young's modulus over a wide range (see paragraphs 10,156, and 157). Because Kye teaches so many different embodiments of his invention with differing Young's modulus values, it shows that these values are result effective variables. Kye teaches an embodiment where the adhesive compositions have a Young's modulus in the range of about 3.9 ksi to about 40 ksi (or about 20 MPa to about 260 MPa) (see paragraph 157). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). Since it is clear from the teaching of Kye that epoxy resins can be modified in order to have a wide range of Young's modulus values, it would have

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been obvious to a person of ordinary skill in the art to find an optimal range for the adhesive taught by Schmid.

Regarding claim 32, Schmid in view of Kye discloses the fuel cell stack according to claim 27, wherein a rigid spacer (51) is provided in the adhesive layer (52) (*Schmid*: see fig. 3d). Schmid discloses that adhesive bonding agent could be an epoxy (see cp./ 5. ;oe 35-40), which are known to be hard substances.

Regarding claim 33, Schmid in view of Kye discloses the fuel cell stack according to claim 32, wherein the rigid spacer (51) is provided in the adhesive layer (52) throughout a non-generation region (see annotated fig. 3d).

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid in view of Kye as applied to claim 27 above, and further in view of Uchida et al. (US Pat. No. 6,316,139) (hereinafter "Uchida").

Regarding claim 31, Schmid in view of Kye fails to disclose the fuel cell stack structure according to claims 27, wherein; the adhesive layer has a thickness of 50  $\mu\text{m}$  to 150  $\mu\text{m}$ .

However, Uchida teaches a fuel cell having a gasket with an adhesive layer, wherein the adhesive layer has a thickness of preferably 10-300  $\mu\text{m}$ . Uchida also teaches that the adhesive layer needs to be thick enough to achieve insulation and sealing between adjacent separators while absorbing the thickness of the ion exchange membrane, therefore proving that it is a result effective variable (see col. 4, lines 4-8). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill

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in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Therefore it would have been obvious to a person of ordinary skill in the art to optimize the thickness taught by Uchida.

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schmid in view of Kye as applied to claim 27 above, and further in view of Mizuno (US Pat Pub. 2001/0049074) (hereinafter "Mizuno").

Regarding claim 39, Schmid in view of Kye fail to disclose the fuel cell stack according to claim 27, wherein the adhesive layer contains rigid beads each of which has a diameter equal to or smaller than a thickness of the adhesive layer.

However, Mizuno teaches a fuel cell having a gasket with an adhesive layer, wherein the adhesive layer contains resin beads of a predetermined diameter in order to regulate the thickness of the adhesive layer (see paragraphs 22 and 57). Since the resin beads regulate the thickness of the adhesive layer, it is obvious that they would have a diameter equal to or smaller than the thickness of the adhesive layer. The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_, \_\_, 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). Therefore, it would have been obvious to a person of ordinary skill in the art to combine the resin beads taught by Mizuno with the adhesive layer taught by Schmid in view of Kye in order to regulate the thickness of the adhesive layer.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHLEY KWON whose telephone number is (571)270-7865. The examiner can normally be reached on Monday to Thursday 7:30 - 6 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK

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